REMARKS/ARGUMENTS

Claims **1 - 50** are pending in the present application. Claims **1, 4 - 9, 11, 14, 15, 17 - 20, 22, 25, 27** - **36, 39 - 41,** and **44 - 50** were amended; and no claims were added or canceled. Reconsideration of the claims is respectfully requested.

I. 35 U.S.C. § 102, Anticipation

The Examiner has rejected claims **1 – 4, 14 – 16, 23 – 29 and 33 - 50** under 35 U.S.C. § 102 as being anticipated by West. This rejection is respectfully traversed.

The cited prior art:

West teaches and shows a special purpose split charged coupled device characterized by two *independently controlled* regions. Furthermore, the two *independently controlled* regions are separated by an asymmetrical split, hence the device is referred to as an asymmetrically split charged coupled device. Each of the two independently controlled regions contains a plurality of *dependently controlled* rows of pixels (see Summary, for example). In each embodiment, discussed in greater detail below, West discloses the first region as being a capture region, in which the spectra are incident, and the second region, on the opposite side of the asymmetrical split, as being a non-capture region. To be sure, West discloses a special purpose charged coupled device and several modes of operation that are operable only in view of that special purpose charged coupled device.

While West generally discusses several modes directed to two separate embodiments: a multiline spectroscopy embodiment; and a kinetic spectroscopy embodiment; the method for reading out the spectral data is similar for both embodiments with respect to the binning operation. With regard to the multiline spectroscopy embodiment, West teaches to line bin multiple spectra that is captured in a relatively larger, independently control region **301** (**FIGs. 3 - 4**), into a relatively smaller region, independently controlled region **302**, prior to separately shifting the individual rows of binned spectra from independently controlled region **302** into horizontal register **304**.

More particularly, a plurality of spectra is placed in independently controlled region **301** as spectra **401** through **404**, each separated by bands of dark charge (**405a – 405d**) (**FIG. 4**) that prevents interference between the spectral bands. The charge is shifted out of independently controlled region **301** by line binning the charge from multiple rows into a single pixel row in independently controlled region **302**, row **406**. These multiple rows of line binned charge may be either the spectra or the dark charge. Importantly, row **406**, the line binning row, is adjacent to asymmetrical split **303** and in the second region. Thus, row **406** is the first row in independently controlled region **302**. The shifting operation is iterated as a sequence of line binning operations between the two regions and across the asymmetrical split therebetween. After each line binning operation, independently controlled region **302** shifts one row toward horizontal register **304**, thereby clearing row **406** for receiving another plurality of rows (of either spectra or dark charge) from independently controlled region **301**, *i.e.*, another line binning operation (col. 4, line 40 to col. 5, line 3).

It should be understood that West teaches against line binning the charge from independently controlled region **302** into horizontal register **304**. As a row is shifted into horizontal register **304**, it is read out simultaneously with rows of charge being shifted out of independently controlled region **301** and line binned into pixel row **406** of independently controlled region **302**. In fact, for achieving maximum efficiency, West teaches to observe an average binning ratio equal to number of rows in the relatively large portion of the CCD divided by the number of rows in the relatively smaller portion of the CCD (col. 5, lines 38 - 41). Observing this ratio ensures that the entire first region, independently controlled region **302**, will be binned into pixel row **406** of independently controlled region **302** in the same time that the entire second region, independently controlled region **304**, is read out of horizontal register **304**. Thus, after each line binning operation, only one row will be shifted into the horizontal register and read out for each line binning operation. From this algorithm, it is clear that West intends that all line binning operations be performed in the pixel row directly adjacent to adjacent to asymmetrical split **303**, *e.g.*, row **406** and not in any horizontal register, *e.g.*, register **304** or **305**.

As for operating in the kinetic spectroscopy embodiment, West teaches that each mode of operation of the kinetic spectroscopy embodiment operates by shifting a

spectrum in one direction to a first horizontal register, and then shifting the dark charge in the opposite direction to a second horizontal register and/or a dump area. More particularly, West generally describes two separate modes of operating the special purpose imaging device with regard to the kinetic spectroscopy embodiment. In each mode, West discloses that the capture region is relatively smaller than the non-capture region (col. 3, lines 3 – 26 (kinetic spectroscopy) and col. 3, lines 31 – 35 (multiline spectroscopy)). With further regard to the first operational mode, the ability to independently control regions **301** and **302** (**FIGs. 3**, **5** and **7**) allows for shifting a captured spectrum to one horizontal register, while dark charge is shifted to the opposite horizontal register and dumped. More particularly, West states that independently control region **302** may be utilized to capture a spectrum, and read out through register **304**, while the remaining dark charge need not be read out through register **304** since the dark charge in region **301** may be separately controlled and read out at the opposite side of the CCD through register **305** (col. 5, lines 42 – 48). Thus, sequentially captured spectra may be read out, in sequential order, from independently controlled region **302**, while simultaneously shifting the unwanted dark charge in the opposite direction, into a separate dump (col. 5, lines 48 - 53).

According to the second mode operating the special purpose imaging device with regard to the kinetic spectroscopy embodiment, a single spectrum is captured in independently controlled region **302**, and then line binned in the first row opposite asymmetrical split **303** in independently controlled region **301**. West does not specifically describe the read out operation for this embodiment, but clearly each individual spectrum must be sequentially read out through horizontal register **305** since the plurality of line binned spectra is being shifted across independently controlled region **301**. Subsequent to each read out operation, other spectra are sequentially captured in independently controlled region **302** and then line binned in the first row opposite asymmetrical split **303** in independently controlled region **301** (col. 5, lines 56 – 63).

<u>The present invention:</u>

In stark contrast to West, claims **1** – **32** are directed to increasing the dynamic range of a <u>conventional charged coupled device</u> that is characterized by two

dependently controlled regions, without a split, by employing a novel two-region line binning operation. Unlike the asymmetrically split charged coupled device disclosed by West, according to the present invention the two regions are dependently controlled and therefore, they cannot be shifted (or controlled) independent of one another. Claims **33** - **50** are directed to by employing a variation of the novel two-region line binning mode for reading out charge accumulated in multiple regions in a conventional charged coupled device that is also characterized by two *dependently controlled* regions, without contaminating charge accumulated in one region with charge accumulated in another region. These regions are suitable for capturing several separate and distinct spectra (*i.e.*, multiline spectroscopy embodiment). Here again, the method is implemented on a conventional charged coupled device, wherein the regions are under dependent control of the controller and, therefore, cannot be shifted (or controlled) independent of one another. The presently claimed invention assumes only a conventional charged coupled device and thus, necessarily, does not facilitate line binning operations across an asymmetrical split in the imaging array, *i.e.,* from a capture region to a non-capture region on the imaging device.

The operational modes of West's kinetic spectroscopy embodiment:

As a general rebuttal, it is respectfully asserted that any reliance on West's kinetic spectroscopy embodiment is improper for the following reasons. First, with regard to either operational mode of the kinetic spectroscopy embodiment disclosed by West, the binning operation is, at best, a one region line binning operation for binning of spectra that are sequential projected in a single region of the CCD. By contrast, each claim of the present invention recites two capture regions, either for enhancing dynamic range of data read from an imaging sensor, simultaneously capturing two spectra in two different regions, or a combination of the two.

In further contrast to first operational mode of the kinetic spectroscopy embodiment, West discloses shifting the captured spectrum across the CCD in one direction, for instance to register **304**, and the associated dark charge across the CCD in the opposite direction and separately read out through a second register, register **305** (see col. 5, lines 41 – 55). All spectra captured using the two-region line binning operation of the presently claimed invention are shifted in the same direction as any

associated dark charge, because the present invention utilizes dependently controlled regions in the line binning operation. Furthermore, since only a single horizontal register is claimed, the captured spectrum (or spectra) and the associated dark charge are shifted in the same direction and, therefore, into the same horizontal register.

On a related point, the examiner alludes to the fact that West discloses that CCD operation in the kinetic spectroscopy mode provides for increase sensitivity, the examiner states:

> The CCD spectroscopy of West, as stated in column 3 (lines 10 — 18 and 30 — 43), provides kinetic spectroscopy wherein a single spectrum occupies multiple rows of elements that are binned to increase sensitivity and also provides multiline spectroscopy wherein plural spectra are captured in a large region and binned into a smaller region.

Whether or not the examiner's statement is completely accurate, certain aspects of the present invention are directed to a novel two-region line binning mode for enhancing the ***dynamic range*** of data read from an imaging sensor and not merely increasing sensitivity. That is, the present invention enables a first region of the imaging array to be devoted to increasing sensitivity, that is to capture spectral wavelengths with relative low amplitudes that are line-binned in the horizontal registers (without a significant increase in noise) and a second region of the imaging array to be devoted to decreasing the sensitivity, or capturing spectral wavelengths with large amplitudes that are subsequently line-binned in the horizontal registers (without saturating the larger amplitudes). Thus, the dynamic range of data is dramatically increased over using only a single region.

<u>Applicable law:</u>

As a threshold matter, Applicant's representative reminds the Examiner that a prior art reference anticipates the claimed invention under 35 U.S.C. § 102 only if every element of a claimed invention is identically shown in that single reference, arranged as they are in the claims, *In re Bond*, 910 F.2d 831, 832, 15 U.S.P.Q.2d 1566, 1567 (Fed. Cir. 1990). Furthermore, the Examiner cannot choose to ignore some elements of the claims and consider others, instead all limitations of the claimed invention must be considered when determining patentability, *In re Lowry*, 32 F.3d 1579, 1582, 32 U.S.P.Q.2d 1031, 1034 (Fed. Cir. 1994). Anticipation focuses on whether a claim reads

on the product or process a prior art reference discloses, not on what the reference broadly teaches, *Kalman v. Kimberly-Clark Corp.*, 713 F.2d 760, 218 U.S.P.Q. 781 (Fed. Cir. 1983).

Furthermore, it is well settled law that the claim must be considered as a whole when making an analysis regarding statutory subject matter. *Parker v. Flook*, 437 U.S. 584 (1978); Diamond v. Diehr, 450 U.S. 175 (1981). "In the context of obviousness, the Court has repeatedly required that the claims be considered as a whole in determining patentability. "In determining the differences between the prior art and the claims, the question under 35 U.S.C. 103 is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious." *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 218 USPQ 871 (Fed. Cir. 1983); *Schenck v. Nortron Corp.*, 713 F.2d 782, 218 USPQ 698 (Fed. Cir. 1983).

<u>Independent Claims 1, 25 and 28:</u>

The examiner states:

> For Claim 1, West discloses, as shown in figures 4 and 5 and as stated in column 4 (lines 29 - 67), column 5 (lines 1 - 3, 10 - 27, and 56 - 62), and column 6 (lines 11 - 13), a method for enhancing dynamic range of data read from an imaging sensor [see below for Examiner's interpretation of this portion of the preamble], said imaging sensor (CCD 300) comprising N linear pixel arrays (column 4, lines 3 and 4, indicates a 1340 M rows x 400 N columns CCD 300), each of the N linear arrays (400 N Columns) having M charge coupled pixels (1340 M Rows), each pixel charge coupled, and further being coupled to one of N registers (Horizontal Charge Transfer Register 304), the method comprising:
>
> integrating charge in at least some pixels of the N linear pixel arrays (In at least sections 401, 402, 403, and 404; see figure 4 and column 4, lines 47 - 59);
>
> combining charge from a first region (at least region 401 containing 8 rows are binned in binning row 406; see figure 4) of the N linear pixel arrays of the imaging sensor in the N registers by shifting charge from the first region along each of the N linear pixel arrays to each of the N registers (The binned spectra rows are reads out through horizontal register 304; see column 4, lines 66 and 67), said first region (401) of the N linear pixel arrays having at least one pixel line (8 rows; see column 4, lines 49 — 59, and column 5, lines 1 - 3) and said at least one pixel line of the first region is oriented in generally orthogonal direction to the N linear pixel arrays;

shifting charge from the N registers along a linear path (Again, West teaches that the binned spectra rows are reads out through horizontal register 304; see column 4, lines 66 and 67);

representing charge from at least a portion of the first region of the N linear pixel arrays, shifted out of the N registers, as a corresponding portion of N first region data signals (As stated in column 5, lines 34 - 40, West states kinetic spectroscopy may be accomplished by capturing a single spectrum comprising multiple rows in region 302, binning such multiple row spectrum into one or more rows in region 301, and then capturing a subsequent spectrum in region 302.);

combining charge from a second region (at least region 402 containing 8 rows are binned in binning row 406; see figure 4) of the N linear pixel arrays in the N registers by shifting charge from said at least one pixel line of the second region along each of the N linear pixel arrays to each of the N registers (The binned spectra rows are reads out through horizontal register 304; see column 4, lines 66 and 67), said second region (403) having at least one pixel line, and said at least one pixel line of the second region is oriented in generally orthogonal direction to the N linear pixel arrays;

shifting charge from the N registers along a linear path (Again, West teaches that the binned spectra rows are reads out through horizontal register 304; see column 4, lines 66 and 67); and

representing charge from at least a portion of the second region of the N linear pixel arrays, shifted out of the N registers, as a corresponding portion of N second region data signals (As stated in column 5, lines 34 - 40, West states kinetic spectroscopy may be accomplished by capturing a single spectrum comprising multiple rows in region 302, binning such multiple row spectrum into one or more rows in region 301, and then capturing a subsequent spectrum in region 302.).

The CCD spectroscopy of West, as stated in column 3 (lines 10 - 18 and 30 - 43), provides kinetic spectroscopy wherein a single spectrum occupies multiple rows of elements that are binned to increase sensitivity and also provides multiline spectroscopy wherein plural spectra are captured in a large region and binned into a smaller region.

The examiner finds support in the same passages of West for the rejections of claims **25** and **28**.

Independent claims **1, 25,** and **28** are directed to enhancing dynamic range of data read from an imaging sensor using a novel two-region line binning mode. The "imaging sensor comprising N linear pixel arrays, each of the N linear arrays having M dependently controlled charge coupled pixels, each pixel charge coupled, and further

being coupled to one of N registers." In other word, a <u>conventional charged coupled device</u> with N linear pixel arrays, each array having M *<u>dependently controlled</u>* charged coupled pixels, and each array is coupled to one of N horizontal registers. Specifically, and according to claim **1**, the method for enhancing the dynamic range of this <u>conventional charged coupled device</u> configured with *<u>dependently controlled</u>* charged coupled pixels comprises:

> integrating charge in at least some pixels of the N linear pixel arrays;
>
> combining charge from a first dependently controlled region of the N linear pixel arrays of the imaging sensor in the N registers by shifting charge from the first dependently controlled region along each of the N linear pixel arrays to each of the N registers, said first dependently controlled region of the N linear pixel arrays having at least one pixel line and said at least one pixel line of the first dependently controlled region is oriented in generally orthogonal direction to the N linear pixel arrays;
>
> shifting charge from the N registers along a linear path;
>
> representing charge from at least a portion of the first dependently controlled region of the N linear pixel arrays, shifted out of the N registers, as a corresponding portion of N first region data signals;
>
> combining charge from a second dependently controlled region of the N linear pixel arrays in the N registers by shifting charge from said at least one pixel line of the second dependently controlled region along each of the N linear pixel arrays to each of the N registers, said second dependently controlled region having at least one pixel line, and said at least one pixel line of the second dependently controlled region is oriented in generally orthogonal direction to the N linear pixel arrays;
>
> shifting charge from the N registers along a linear path; and
>
> representing charge from at least a portion of the second dependently controlled region of the N linear pixel arrays, shifted out of the N registers, as a corresponding portion of N second region data signals.

The invention as recited in claims **25** and **28** is similar.

Initially, it is not immediately clear from the body of the rejection how the examiner incorporates either of the operational modes for the kinetic spectroscopy embodiment disclosed by West with the multiline spectroscopy embodiment. Nowhere does West describe combining the embodiments, or incorporating an operational mode of one embodiment in the other embodiment. Furthermore, it is not immediately clear

how the multiline spectroscopy embodiment disclosed by West could operate as the kinetic spectroscopy embodiment, that is, by shifting the spectrum in one direction to a first horizontal register and shifting the dark charge in the opposite direction to a second horizontal register or dump. Moreover, kinetic spectroscopy generally refers to repeatedly capturing one spectrum after another, thus the captured spectra are sequential in nature. Multiline spectroscopy, on the other hand, generally refers to capturing multiple spectra simultaneously, thus the captured spectra are temporal in nature. Therefore, it is respectfully asserted that any analysis that combines the features of the two embodiments to reach the present invention is improper, because: 1) it is not clear that such a combination is operable, and; 2) the combination is not taught or suggested by West. To the contrary, West specifically discloses utilizing the asymmetrically split charged coupled device for either multiline spectroscopy or kinetic spectroscopy (see col. 5, line 64 to col. 6, line 7, where West discusses switching from multiline spectroscopy to kinetic spectroscopy, or vice versa). Therefore, it is respectfully asserted that combining features from the two separate is a product of impermissible hindsight.

> "[I]t is impermissible to use the claimed invention as an instruction manual or 'template' to piece together the teachings of the prior art so that the claimed invention is rendered obvious ... .This court has previously stated that '[o]ne cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention.'" *In re Fritch*, 972 F.2d 1260, 23 USPQ2d 1780 (Fed. Cir. 1992)

According to the presently claimed invention, charge is integrated in at least some pixels of the N linear pixel arrays of the first and second regions of the imaging array. Then, the charge from a first *dependently controlled* region of the N linear pixel arrays is combined (or line-binned) in the " N registers" "by shifting charge from the first dependently controlled region." Thus, according to the present invention, the "combining" (or line-binning operation) occurs in the N registers. That charge is then shifted out of the N registers and, at least a portion of which, is represented as N first region data signals.

Next, portion of the charge integrated in the second *dependently controlled* region of the N linear pixel arrays is combined (or line-binned) in the "N registers" "by shifting charge from the second dependently controlled region." Here again,

"combining" (or line-binning operation) occurs in the N registers. That charge is then shifted out of the N registers and, at least a portion of which, is represented as N second region data signals.

West does not teach or suggest these features. Firstly, and as mentioned above, West explicitly teaches integrating charge in only a single region for each operational mode of the kinetic spectroscopy embodiment. Therefore, it is respectfully asserted that the disclosure of the kinetic spectroscopy embodiment does not teach or suggest the presently claimed invention.

With regard to the multiline spectroscopy embodiment, West explicitly teaches a special purpose split charged coupled device characterized by two *independently controlled* regions separated by an asymmetrical split, *i.e.*, an asymmetrically split charged coupled device. Furthermore, rather than "combining charge from a first dependently controlled region of the N linear pixel arrays of the imaging sensor in the N registers ..." and "combining charge from a second dependently controlled region of the N linear pixel arrays in the N registers ...," as recited in the claims, West explicitly teaches combining the charge accumulated in one region in the first row of pixels of the second region, that is, in the row of pixels adjacent to the asymmetrical split that separates the two regions.

Furthermore, West explicitly teaches that the first region of pixel rows and the second region of pixel rows are independently controlled. Independent control of the regions makes it possible to shift the charge in the first region without shifting the charge in the second region. In the presently claimed invention, on the other hand, the first and second regions are dependently controlled. Therefore, as the charge is shifted "... from the first dependently controlled region along each of the N linear pixel arrays to each of the N registers," the charge in the second dependently controlled region is also shifted toward the N registers. It is respectfully asserted that nothing in West teaches or suggests the presently claimed invention.

Therefore, it is respectfully asserted that West neither teaches nor suggests the present invention because West does not teach or suggest combining charge that was integrated in the first and second regions in the N registers, but instead teaches binning charge from one region in the first row pixels in the other region, and further because

West does not teach or suggest two dependently controlled regions but instead the operation of West's device relies on two independently controlled regions that are separated by asymmetrical split.

In light of the foregoing, it is respectfully asserted that the rejection of claims **1, 25** and **28** under 35 U.S.C. § 102 has been overcome and those claims are now in condition for allowance.

Since claims **2 - 4, 14 - 16, 23 - 24, 27** and **29** depend from claims **1, 25** and **28**, the same distinctions between West and the claimed invention in claims **1, 25** and **28** exists for these claims. Additionally, claims **2 - 4, 14 - 16, 23 - 24, 27** and **29** claim other additional combinations of features not suggested by the reference. Consequently, it is respectfully urged that the rejections of claims **2 - 4, 14 - 16, 23 - 24, 27** and **29** have been overcome.

<u>Independent Claim 33:</u>

The examiner states:

> For Claim 33, West discloses, as shown in figures 4 and 5 and as stated in column 4 (lines 29 - 67), column 5 (lines 1 - 3, 10 - 27, and 56 - 62), and column 6 (lines 11 - 13), a method for reading data from an imaging sensor (300), said imaging sensor (CCD 300) comprising N linear pixel arrays (column 4, lines 3 and 4, indicates a 1340 M rows x 400 N columns CCD 300), each of the N linear arrays (400 N Columns) having M charge coupled pixels (1340 M Rows), each pixel charge coupled, and further being coupled to one of N registers (Horizontal Charge Transfer Register 304), the method comprising:
>
> defining a first region (at least region 401 containing 8 rows are binned in binning row 406; see figure 4) of the N linear pixel arrays of the imaging sensor, said first region (401) of the N linear pixel arrays having at least one pixel line (8 rows; see column 4, lines 49 - 59, and column 5, lines 1 - 3) and said at least one pixel line of the first region is oriented in generally orthogonal direction to the N linear pixel arrays;
>
> defining a second region (at least region 402 containing 8 rows are binned in binning row 406; see figure 4) of the N linear pixel arrays of the imaging sensor, said second region (403) having at least one pixel line, and said at least one pixel line of the second region is oriented in generally orthogonal direction to the N linear pixel arrays;

defining a dark region (at least region 405a containing 8 rows) of the N linear pixel arrays of the imaging sensor, said dark region having a plurality of pixel lines (8 rows; see column 4, lines 47 - 57), said plurality of pixel lines are oriented in generally orthogonal direction to the N linear pixel arrays and said plurality of pixel lines are not exposed to light (see column 4, lines 31 - 34);

receiving a first image (multiline spectroscopy mode) on at least some of the pixels of the first region (401) of the N linear pixel arrays (see column 5, lines 10 - 40);

receiving a second image (multiline spectroscopy mode) on at least some of the pixels of the second region (402) of N linear pixel arrays (again see column 5, lines 10 - 40);

integrating charge in at least some pixels of the first region (401) of the N linear pixel arrays and in the at least some pixels of the second region (402) of the N linear pixel arrays (in at least sections 401, 402, 403, and 404; see figure 4 and column 4, lines 47 - 59);

reading out charge from said dark region (405a - 405d), said charge from said dark region having been shifted from each region (401 and 402) defined on the N linear pixel arrays of the imaging sensor (300; see column 5, lines 10 - 40).

The CCD spectroscopy of West, as stated in column 3 (lines 10 - 18 and 30 - 43), provides kinetic spectroscopy wherein a single spectrum occupies multiple rows of elements that are binned to increase sensitivity and also provides multiline spectroscopy wherein plural spectra are captured in a large region and binned into a smaller region.

Independent claim **33** is directed to reading data from an imaging sensor, the "imaging sensor comprising N linear pixel arrays, each of the N linear arrays having M dependently controlled charge coupled pixels, each pixel charge coupled, and further being coupled to one of N registers. As discussed above, a <u>conventional charged coupled device</u> with N linear pixel arrays, each array having M <u>*dependently controlled*</u> charged coupled pixels, and each array is coupled to one of N horizontal registers. Specifically, and according to claim **33**, the method for reading data from this <u>conventional charged coupled device</u> configured with <u>*dependently controlled*</u> charged coupled pixels comprises:

defining a first dependently controlled region of the N linear pixel arrays of the imaging sensor, said first dependently controlled region having at least one pixel;

> defining a second dependently controlled region of the N linear pixel arrays of the imaging sensor, said second dependently controlled region having at least one pixel line, and said first and second dependently controlled regions having at least three pixel lines, and said at least three pixel lines of said first and second dependently controlled regions being oriented in generally orthogonal direction to the N linear pixel arrays;
>
> defining a dark dependently controlled region of the N linear pixel arrays of the imaging sensor, said dark dependently controlled region having a plurality of dependently controlled pixel lines, said plurality of dependently controlled pixel lines are oriented in generally orthogonal direction to the N linear pixel arrays and said plurality of dependently controlled pixel lines are not exposed to light;
>
> receiving a first image on at least some pixels of the first dependently controlled region of the N linear pixel arrays;
>
> receiving a second image on at least some pixels of the second dependently controlled region of the N linear pixel arrays;
>
> integrating charge in the at least some pixels of the first dependently controlled region of the N linear pixel arrays and in the at least some pixels of the second dependently controlled region of the N linear pixel arrays;
>
> shifting charge from the at least some pixels of the first region and second dependently controlled region of the N linear pixel arrays along a linear path into said dark dependently controlled region of the N linear pixel arrays of the imaging sensor; and
>
> reading out charge from said dark dependently controlled region, said charge from said dark dependently controlled region having been shifted from each dependently controlled region defined on the N linear pixel arrays of the imaging sensor.

As discussed above with regard to the rejection of claim **1,** Applicant's representative reiterates that any analysis that combines the features of the kinetic spectroscopy and multiline spectroscopy embodiments to reach the present invention is improper, because: 1) it is not clear that such a combination is operable, and; 2) the combination is not taught or suggested by West.

According to the present invention as recited in claim **33**, a first image is received "on at least some pixels of the first dependently controlled region of the N linear pixel arrays," and a second image is received "on at least some pixels of the second dependently controlled region of the N linear pixel arrays," and the charge is integrated

"in the at least some pixels of the first dependently controlled region of the N linear pixel arrays and in the at least some pixels of the second dependently controlled region of the N linear pixel arrays." Then the charge "from the at least some pixels of the first region and second dependently controlled region of the N linear pixel arrays" is shifted into the "dark dependently controlled region of the N linear pixel arrays of the imaging sensor." Finally, the charge from the dark dependently controlled region, said charge from said dark dependently controlled region having been shifted from each dependently controlled region defined on the N linear pixel arrays of the imaging sensor.

West teaches the operation of multiline spectroscopy as a plurality of spectra in the first region, each spectrum "separated by bands of dark charge in order to prevent interference caused by energy from one spectrum spilling over into another spectrum, (col. 4, lines 28 – 39, see also **FIG. 4**). The first region that includes the bands of spectra and dark charge are independently controlled from a second region that is located on the opposite of an asymmetrical split from the first region. A spectral band is shifted out of the first region and binned in the first row of the second region, the row adjacent to the asymmetrical split. That binned row is then shifted away from the asymmetrical split and another spectral band binned in the first row of the second region. Alternatively, a band of dark charge may be binned in the first row of the second region. In any case, the first row of the second region is then shifted away from the asymmetrical split to make room for another binning operation in the first row of the second region.

The examiner's rational for rejecting claim **33** is not well understood, but apparently the examiner is of a mind that the dark region could be defined "(at least region **405a** containing 8 rows)" and then spectra from bands **401** and **402** could be shifted into band **405a**. Firstly, West describes bands of spectra separate by bands of "**dark charge**." Those of ordinary skill in the art would readily understand the West's use of "dark charge" to mean charge that is contaminated or possibly contaminated, such as with two different spectra, *e.g.*, spectral bands **401** and **402**, or spectral bands **402** and **403**, or spectral bands **403** and **404**. West states:

> In operation of multiline spectroscopy, a plurality of spectra are placed in region 301, each separated by bands of dark charge in order to prevent interference caused by energy from one spectrum spilling over into

> another spectrum. FIG. 4 shows a conceptual representation of the device of FIG. 3, utilized in its multiline spectroscopy mode including a plurality of exemplary spectra 401 through 404 included thereon. Spectra 401 through 404 are separated by regions 405 in order to prevent contamination of energy from one spectra to another.

West discloses binning the spectra bands separate from the dark charge bands in each example (see col. 4, lines 40 – 46, and lines 47 – 59, and lines 60 – 65 and even the non-constant binning example on col. 5, lines 16 - 41). Binning the spectral bands separately from the dark charge bands is necessary only if the bands may be contaminated with spectra from both sides of the dark charge band. If, as the examiner asserts, band **405a** is a dark region, where no light is captures, then the spectral bands on either side cannot be contaminated, but contain no charge due to the light shielding. However, this is not the case. West treats band **405a** – **405d** as having dark, and unusable charge. Thus, band **405a** is not a dark region as recited in the claims, but actually a band of dark charge, or charge that is contaminated and unusable.

In any case, West specifically discloses that each spectral bands **401** – **404** has the same number of rows as each of dark bands **405a** – **405d**. This is logical because binning takes place in row **406**, on the opposite side of the asymmetric split, and without the light and dark bands having the same number of rows, the dark charge would contaminate the spectra during binning. Notice, even in the discussion of non-constant binning algorithm on col. 5, lines 12 – 41, the dark charge bands are defined as having the same number of rows as the spectral bands, *e.g.*, ten rows, to avoid contaminating the spectra with dark charge during binning. Therefore, according to West, two bands of spectra could not be shifted into a single band of dark charge because all of the bands are the same size. Furthermore, since each spectrum band has an adjacent band of dark charge, at best only half of a spectrum and half of a dark charge band could be shifted into a band of dark charge, for instance bank **405a**., and not two spectrum bands as recited in claim **33**.

It is respectfully asserted that nowhere does West teach or suggest "shifting charge from the at least some pixels of the first region and second dependently controlled region of the N linear pixel arrays along a linear path into said dark dependently controlled region of the N linear pixel arrays of the imaging sensor," as recited in claim **33**.

In light of the foregoing, it is respectfully asserted that the rejection of claim **33** under 35 U.S.C. § 102 has been overcome and those claims are now in condition for allowance.

Claim 34:

The examiner states:

As for Claim 34, West discloses combining charge integrated in a region (301) in a region of the N linear pixel arrays of the imaging sensors (300) in the N registers by shifting charge from the dark region (405a — 405d) along each of the N linear pixel arrays in the N registers; shifting charge from the N registers along a linear path; and representing charge from at least a portion of the region (301) of the N linear pixel arrays, shifted out of the N registers, as a corresponding portion of N data signals associated with the region (As stated in column 5, lines 34 — 40, West states kinetic spectroscopy may be accomplished by capturing a single spectrum comprising multiple rows in region 302, binning such multiple row spectrum into one or more rows in region 301, and then capturing a subsequent spectrum in region 302.).

Applicant's representative disagrees with the examiner assertion.

Claim **34** recites:

The method for reading data recited in claim 33 above, wherein, for each dependently controlled region, reading out charge from said dark dependently controlled region further comprises:

combining charge integrated in a region of the N linear pixel arrays of the imaging sensor in the N registers by shifting charge from the dark dependently controlled region along each of the N linear pixel arrays to each of the N registers;

shifting charge from the N registers along a linear path; and

representing charge from at least a portion of the dependently controlled region of the N linear pixel arrays, shifted out of the N registers, as a corresponding portion of N data signals associated with the dependently controlled region.

As discussed elsewhere above, nowhere does teach or suggest combining charge in the horizontal registers, but instead West explicitly discloses binning the spectral and dark charge bands in row **406**, directly adjacent to, but on the opposite side of the asymmetric split from bands **402 - 404** and **405a - 405d**.

Therefore, it is respectfully asserted that does not West teach or suggest "combining charge integrated in a region of the N linear pixel arrays of the imaging sensor in the N registers by shifting charge from the dark dependently controlled region along each of the N linear pixel arrays to each of the N registers," as recited in claim **34**.

In light of the foregoing, it is respectfully asserted that the rejection of claim **34** under 35 U.S.C. § 102 has been overcome and those claims are now in condition for allowance.

Since claims **35 - 39** depend from claim **34**, the same distinctions between West and the claimed invention in claims **33** and **34** exists for these claims. Additionally, claims **35 - 39** claim other additional combinations of features not suggested by the reference. Consequently, it is respectfully urged that the rejections of claims **35 - 39** have been overcome.

Independent Claim 41:

The Examiner states:

> For Claim 41, West discloses, as shown in figures 4 and 5 and as stated in column 4 (lines 29 — 67), column 5 (lines 1 — 3, 10 — 27, and 56 — 62), and column 6 (lines 11 -- 13), a method for enhancing dynamic range of data read from an imaging sensor [see below for Examiner's interpretation of this portion of the preamble], said imaging sensor (CCD 300) comprising N linear pixel arrays (column 4, lines 3 and 4, indicates a 1340 M rows x 400 N columns CCD 300), each of the N linear arrays (400 N Columns) having M charge coupled pixels (1340 M Rows), each pixel charge coupled, and further being coupled to one of N registers (Horizontal Charge Transfer Register 304), the method comprising:
>
> integrating charge in at least some pixels of a first region (401) of the N linear pixel arrays (In at least sections 401, 402, 403, and 404; see figure 4 and column 4, lines 47 — 59) and at least some pixels of a second region (402) of the N linear pixel arrays, said first region (at least region 401 containing 8 rows are binned in binning row 406; see figure 4) of the N linear pixel arrays of the imaging sensor, said first region (401) of the N linear pixel arrays having at least one pixel line (8 rows; see column 4, lines 49 — 59; and column 5, lines 1— 3) and said at least one pixel line of the first region is oriented in generally orthogonal direction to the N linear pixel arrays; and said second region (at least region 402 containing 8 rows are binned in binning row 406; see figure 4) of the N linear pixel arrays of the imaging sensor, said second region (403) having at least one

pixel line, and said at least one pixel line of the second region is oriented in generally orthogonal direction to the N linear pixel arrays;

combining charge from a first region (at least region 401 containing 8 rows are binned in binning row 406; see figure 4) of the N linear pixel arrays of the imaging sensor in the N

registers by shifting charge from the first region along each of the N linear pixel arrays to each of the N registers (The binned spectra rows are reads out through horizontal register 304; see column 4, lines 66 and 67), said first region (401) of the N linear pixel arrays having at least one pixel line (8 rows; see column 4, lines 49 — 59, and column 5, lines 1 — 3) and said at least one pixel line of the first region is oriented in generally orthogonal direction to the N linear pixel arrays;

shifting charge from the at least some pixels of the first (401) and second regions (402) of the N linear pixel arrays along a linear path (Again, West teaches that the binned spectra rows are reads out through horizontal register 304; see column 4, lines 66 and 67) into a dark region (at least region 405a containing 8 rows) of the N linear pixel arrays of the imaging sensor, said dark region having a plurality of pixel lines (8 rows; see column 4, lines 47 — 57), said plurality of pixel lines are oriented in generally orthogonal direction to the N linear pixel arrays and said plurality of pixel lines are not exposed to light (see column 4, lines 31 — 34);

representing charge from at least a portion of the first region of the N linear pixel arrays, shifted out of the N registers, as a corresponding portion of N first region data signals (As stated in column 5, lines 34 — 40, West states kinetic spectroscopy may be accomplished by capturing a single spectrum comprising multiple rows in region 302, binning such multiple row spectrum into one or more rows in region 301, and then capturing a subsequent spectrum in region 302.);

combining charge from a second region (at least region 402 containing 8 rows are binned in binning row 406; see figure 4) of the N linear pixel arrays in the N registers by shifting charge from said at least one pixel line of the second region along each of the N linear pixel arrays to each of the N registers (The binned spectra rows are reads out through horizontal register 304; see column 4, lines 66 and 67), said second region (403) having at least one pixel line, and said at least one pixel line of the second region is oriented in generally orthogonal direction to the N linear pixel arrays;

shifting charge from the N registers along a linear path (Again, West teaches that the binned spectra rows are reads out through horizontal register 304; see column 4, lines 66 and 67);

representing charge from at least a portion of the second region of the N linear pixel arrays, shifted out of the N registers, as a corresponding portion of N second region data signals (As stated in column 5, lines 34 —

> 40, West states kinetic spectroscopy may be accomplished by capturing a single spectrum comprising multiple rows in region 302, binning such multiple row spectrum into one or more rows in region 301, and then capturing a subsequent spectrum in region 302.);
>
> and clearing charge from the dark region of the N linear pixel arrays of the imaging sensor (column 6, lines 1 — 6).
>
> The CCD spectroscopy of West, as stated in column 3 (lines 10 — 18 and 30 — 43), provides kinetic spectroscopy wherein a single spectrum occupies multiple rows of elements that are binned to increase sensitivity and also provides multiline spectroscopy wherein plural spectra are captured in a large region and binned into a smaller region.

Here again, the precise rationale for the examiner's rejection is not well understood, but the examiner is clearly incorporating features from the kinetic spectroscopy embodiment into the multiline spectroscopy embodiment. As mentioned elsewhere above, West does not teach or suggest combining the separate embodiments, or incorporating an operational mode of one embodiment in the other embodiment. Furthermore, even though West teaches that "kinetic spectroscopy may be accomplished by capturing a single spectrum comprising multiple rows in region **302**, binning such multiple row spectrum into one or more rows in region **301**, and then capturing a subsequent spectrum in region **302**," that same principle destroys the usefulness of multiline spectroscopy. Multiline spectroscopy, as generally understood in the art, is useful because multiple spectra are captured temporally, not sequentially. Furthermore, is not immediately clear how the multiline spectroscopy embodiment disclosed by West could operate as the kinetic spectroscopy embodiment, that is, by shifting the spectrum in one direction to a first horizontal register and shifting the dark charge in the opposite direction to a second horizontal register or dump. Therefore, it is respectfully asserted that any analysis that combines the features of the two embodiments to reach the present invention is improper, because: 1) it is not clear that such a combination is operable, and; 2) the combination is not taught or suggested by West. To the contrary, West specifically discloses utilizing the asymmetrically split charged coupled device for either multiline spectroscopy or kinetic spectroscopy (see col. 5, line 64 to col. 6, line 7, where West discusses switching from multiline spectroscopy to kinetic spectroscopy, or vice versa). Therefore, combining feature from the two separate is at best a product of impermissible hindsight.

Furthermore, the rejection of claim **41** is improper for the same reasons as discussed above with regard to claim **33**.

It is respectfully asserted that does not West teach or suggest "combining charge integrated in the first dependently controlled region of the N linear pixel arrays of the imaging sensor in the N registers by shifting charge from the dark dependently controlled region along each of the N linear pixel arrays to each of the N registers," or "combining charge integrated in the second dependently controlled region of the N linear pixel arrays of the imaging sensor in the N registers by shifting charge from the dark dependently controlled region along each of the N linear pixel arrays to each of the N registers" as recited in claim **41**.

In light of the foregoing, it is respectfully asserted that the rejection of claim **42** under 35 U.S.C. § 102 has been overcome and those claims are now in condition for allowance.

Since claims **42 - 50** depend from claim **41**, the same distinctions between West and the claimed invention in claim **41** exists for these claims. Additionally, claims **42 - 50** claim other additional combinations of features not suggested by the reference. Consequently, it is respectfully urged that the rejections of claims **42 - 50** have been overcome.

VII. Conclusion

It is respectfully urged that the subject application is patentable over West and is now in condition for allowance.

The Examiner is invited to call the undersigned at the below-listed telephone number if in the opinion of the Examiner such a telephone conference would expedite or aid the prosecution and examination of this application.

Respectfully submitted,

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